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# THE HARVEST MOON.

### BY ORRIN E. HARMON.

In September, 1894, for the first time in nearly nineteen years, the harvest Moon will appear in her full splendor. As the Moon's ascending node will be only 1° 35′ from the vernal equinox on the 14th of September, the date of full Moon, the inclination of her orbit to the horizon will be very nearly the same as if the node were exactly at the equinox.

As every student of astronomy knows, the effect of this position of the Moon's ascending node is to render the inclination of her orbit to the horizon a minimum when the vernal equinox is in the eastern horizon. Hence, the intervals between the times of the Moon's rising, near the September full Moon, are also at a minimum. For the purpose of showing these intervals I have prepared the following table, giving the times of the Moon's rising from September 13 to September 21, inclusive. This table is computed for the parallels of Lat. 37° and 47°, and for the meridian of 8 hours :

| 1894. | LATITUDE 37° N. | | LATITUDE 47° N. | |
|---|---|---|---|---|
| | MOON RISES. | INTERVAL. | MOON RISES. | INTERVAL. |
| | H. M. | H. M. | H. M. | H. M. |
| September 13 . . . | 5 41 | . . . | 5 54 | . . . |
| " 14 . . . | 6 06 | 0 25 | 6 10 | 0 16 |
| " 15 . . . | 6 27 | 0 21 | 6 25 | 0 15 |
| " 16 . . . | 6 52 | 0 25 | 6 39 | 0 14 |
| " 17 . . . | 7 14 | 0 22 | 6 57 | 0 18 |
| " 18 . . . | 7 44 | 0 30 | 7 17 | 0 20 |
| " 19 . . . | 8 21 | 0 37 | 7 44 | 0 27 |
| " 20 . . . | 9 05 | 0 44 | 8 20 | 0 36 |
| " 21 . . . | 9 58 | 0 53 | 9 09 | 0 49 |

Remembering that the average interval between the times of the Moon's rising is about $51^m$, the intervals above noted, for the few evenings after the full Moon, show a marked diminution from the mean interval.

Now the very cause that makes the inclination of the Moon's orbit to the horizon a minimum at the September full Moon, makes this inclination a maximum at the March full Moon. Full Moon happens March 21, 1894, and the ascending node will then be about 11° from the vernal equinox. Of course, the inclination of the Moon's path to the horizon is not quite so large as it would be if the ascending node were at the equinox; but it is sufficiently large to show a decided increase in the intervals between the times of the Moon's rising. Between March 20 and March 26, at Lat. 37° north, these intervals vary between $1^h\ 02^m$ and $1^h\ 09^m$; and at Lat. 47° north, between $1^h\ 09^m$ and $1^h\ 16^m$.

As we watch the Moon's rising during the evenings of the harvest Moon, it is interesting to note the changing positions of her path with respect to the horizon and meridian. To show this change I have made a calculation, and the results are given in the following table. I have selected the time of the Moon's rising on September 13 and September 21:

| 1894. ELEMENTS OF THE MOON'S PATH. | LATITUDE 37° N. | | LATITUDE 47° N. | |
|---|---|---|---|---|
| | SEPT. 13. $5^h\ 41^m$ | SEPT. 21. $9^h\ 58^m$ | SEPT. 13. $5^h\ 54^m$ | SEPT. 21. $9^h\ 9^m$ |
| | ° ′ | ° ′ | ° ′ | ° ′ |
| Declination of Meridian crossing-point . . . . . | — 28 12 | — 15 04 | — 28 27 | — 20 02 |
| Angle of Meridian crossing-point . . . . . . . | 84 23 | 65 16 | 86 00 | 68 59 |
| Inclination to Horizon . . | 25 23 | 44 15 | 15 04 | 30 45 |
| Amplitude in Horizon . . | 13 11<br>S. of E. and N. of W. | 36 51<br>N. of E. and S. of W. | 15 33<br>S. of E. and N. of W. | 44 33<br>N. of E. and S. of W. |

On the 14th of October, 1894, the Moon's ascending node will be exactly at the vernal equinox. Eighteen years and seven months will elapse before the node will again be at the equinox. The westward motion of the Moon's nodes on the ecliptic is one of the many beautiful movements which the mechanism of the heavens displays. But while her nodes are making this circuit on the ecliptic, what is the position of her equatorial nodes or the lunar equinoxes? A simple calculation shows that they vibrate each side of the solar equinoxes, always keeping within the limit of 13° 9′. There is a remarkable agreement between these figures and the figures expressing the Moon's mean daily motion among the stars.

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